

TEXAS REPTILES AND THEIR FAUNAL RELATIONS.

BY ARTHUR ERWIN BROWN.

THE REPTILES OF PECOS.

The town of Pecos, Texas, lies on the west bank of the river bearing the same name, at an elevation of about 2,800 feet. The high plain surrounding it and stretching west to the Rio Grande is much broken by irregular mountain ranges of considerably greater height.

The rainfall at Pecos does not exceed fifteen inches. The mean annual temperature is 60° Fahr., and the winter minimum about 18°.

During the past four years forty-eight species and subspecies of living reptiles have been sent to the Zoological Gardens by Mr. E. Meyenberg, of Pecos, all of which were collected in the neighborhood, with the exception of a few from the Davis Mountains, some fifty miles southwest. Many of these are little known and as I am aware of no published list of similar extent from this region, they are here enumerated.

CHELONIA.

Cinosternum flavescens (Agass.).

Platythyrus flavescens Agass., Cont. Nat. Hist. of U. S., I, 430, Pl. V, figs. 12-15.

(?) *Cinosternum flavescens* Coues, Wheeler Survey W. of 100th Mer., p. 590, Pl. XVII.

Sufficient material is not available for full determination of the mud-turtles of the Mexican border, and identification of the present species must be made upon slight clues, for no published description of it exists beyond the mention of a few characters considered by Agassiz to be generic. These appear to apply to four turtles received in September, 1901, from Pecos. In addition, I have a similar one from El Paso, collected by Messrs. Townsend and Barber, and there is a sixth belonging to the Academy, collected at San Antonio, in 1903, by Dr. H. A. Pilsbry.

In form and scutellation these turtles approach *C. pennsylvanicum*. The El Paso specimen is 130 mm. in extreme length of shell and 97 in greatest breadth, a size rarely, if ever, reached by the eastern species. In adult males the shell is depressed on the dorsal line and shows traces

of a median keel, which does not appear in others, possibly female, of less dimensions. The small San Antonio example shows it slightly on the posterior declivity. The head is noticeably narrow and flat: jaws weak and beak feebly hooked. The feet are fully webbed and the fore-claws large and strong. There is a patch of keeled tubercles above the heel.

The large El Paso specimen, which is male, is uniform greenish-olive on the carapace, each shield having a narrow black border on its hinder margin, most marked on the costals. The plastron, which is concave and deeply striated, is yellow deepening to dark brown on the gulars and anals and on the bridge. The head and neck are entirely without markings, uniform dark gray above, whitish on the sides and beneath. Jaws yellowish with dark brown cutting edges. Outer surface of limbs dark gray without markings, lighter beneath. The largest Pecos specimen is 120 mm. long and is similar, except that the back is darker, the plastron decidedly green and less grooved. This is probably a female. The others are colored like the last, except one from Pecos 110 mm. long, which has the carapace brownish-yellow, with hardly a trace of green, and the dark margins to the shields hardly visible. The edge and under side of the marginals is dull orange. Plastron yellow, darker in front and behind.

Compared with Pl. XVII in the *Wheeler Survey*, to which the name *C. flavescens* is attached, all my specimens have the shell narrower and more regularly oval; the head and neck are noticeably flat and narrow, and the pectoral shields are nearly triangular and form an exceedingly short suture as in *pennsylvanicum*, instead of the wide one shown by the plate.

This species is nearly related to *pennsylvanicum*, but as far as present material goes, is amply distinguished by its form of head and by color characters.

Its geographical limits remain to be established. All the specimens I have seen are Texan.

Chrysemys mobilensis (Holbr.).

Chrysemys elegans (Wied.).

Terrapene ornata (Agass.).

LACERTILIA.

Crotaphytus collaris (Say).

Some of the Pecos specimens exhibit the double row of inter-orbitals attributed to *C. baileyi* Stej.¹ I have also a number of

¹ *No. Am. Fauna*, No. 3, p. 103, Pl. XII, fig. 1.

C. collaris from Seymour, Texas. In this series I find individuals with a single row of interorbitals, and those with them partly divided, to be each about two-fifths of the whole number, and those with a double row about one-fifth. In association with these differences I do not find any constant changes in the size of the supraoculars, in length of snout or breadth of head. The last two proportions vary with age, old examples having much broader heads. These Seymour specimens are about half-grown and were all collected together.

The chief character of *baileyi* we thus find far outside of the region assigned to it, in company with undoubted *collaris* and intermediates. Two *Crotaphytus* in the Academy's collection, taken by Rehn and Viereck in 1902, at Dry Cañon, New Mexico, and assigned by Mr. Stone² to *C. c. baileyi* are like the Pecos and Seymour examples with double interorbitals. If these specimens are *baileyi*, it occurs promiscuously among *collaris*; if they are not *baileyi*, then the chief character of that species occurs as a meaningless variation in *collaris*, leaving the former species to stand upon slight and indefinable differences which vary with age. In either case, the foundations of *baileyi* are not strengthened by their appearance.

***Crotaphytus wislizeni* B. & G.**

Femoral pores in two specimens 18-22. Length of ♀ 324 mm. (tail 208). This specimen in June has on the sides vertical bands and spots of vermilion, which extend on the upper surface of the fore and hind limbs and the under side of the tail. The pale cross-bands have entirely disappeared from the body, but are distinct on another specimen 305 mm. long.

***Holbrookia maculata* Girard.**

Five specimens belonging to the form considered by Cope to be *H. m. maculata*. Femoral pores in most cases 11 or 13; maximum 13, minimum 9.

***Holbrookia texana* (Trosch.).**

Femoral pores usually 14-15; maximum in nineteen specimens 16, minimum 12; very inconspicuous in females. The hind leg may fall short of the eye or reach to the end of the snout. A ♂ in June, doubtless in full breeding color, is very striking, there being much orange on the shoulders, including the upper back, and on the forearms. The hinder part of the back and sides and upper surface of the hind legs are bright green, becoming yellowish on the tail. The jet-black lateral crescents are set in a patch of rich blue which does not meet its fellow

² *Proc. Acad. of Nat. Sci.*, 1903. p. 30.

on the abdomen. Under side of thigh pale blue; back of upper arm and front of forearm green.

In this species the postinfralabials below the angle of the jaw are usually in but one or two rows, but occasionally, as in the male above described, they are as numerous as in *H. maculata*.

***Uta stansburiana* B. & G.**

Femoral pores in eighteen specimens 13-18. Greatest length 150 mm. (tail 93).

***Uta ornata* B. & G.**

Femoral pores 12-16, usually about 13. Greatest length 130 mm. (tail 78).

The chief difference between *U. ornata* and *U. symmetrica* is said to be³ that in the former the hind leg is usually shorter than the distance from the collar to the vent, while in the last it is longer. In nineteen *U. ornata* from Pecos and Seymour, I find that 3 ♂ and 1 ♀ have the hind leg longer than the distance stated; 4 ♂ and 1 ♀ have it equal; and in 10 ♀ it is shorter.

***Sceloporus spinosus clarkii* B. & G.**

Four specimens received in May, 1901, from Pecos (now Nos. 15,743-46 Academy collection) are referred to this subspecies. They have the hinder large supraoculars in contact with the parietals and frontoparietals; the preauricular scales are broader than long; femoral pores 12-13; and an interrupted cervical collar.

The distinction between this form and *S. magister* is of doubtful validity, a specimen from Tucson, Arizona, now before me, which on its preauricular scales would be assigned by Mr. Stejneger to the last name, is less distinctly banded on the forearms than two of the Pecos specimens.

***Sceloporus torquatus poinsetti* B. & G.**

Apparently very common.

***Sceloporus consobrinus* B. & G.**

A large number of specimens are well distinguished from *S. undulatus* by color characters, as well as by the slight differences in scutellation pointed out by Cope.

***Phrynosoma cornutum* (Harl.).**

***Phrynosoma modestum* Girard.**

***Cnemidophorus sexlineatus sexlineatus* (L.).**

Two from Pecos do not differ materially from eastern examples except in having coarser dorsal scales, but four others collected at Sey-

³ Stejneger, *No. Am. Fauna*, No. 3, p. 107.

mour, Baylor county, in northern-central Texas, have similarly coarse scales, one has the collar-edge occupied by a row of granules, and in another the large scales of the collar are most distinct in the centre. The pale dorsal area shows a tendency to contract and take on the form of a median stripe. All these differences being in the direction of *C. perplexus*. These specimens are noticeable for their small number of femoral pores, which are in each 13-14; (2) 14-15; 15-16. The usual range in *sexlineatus* being 15-19.

***Cnemidophorus sexlineatus perplexus* B. & G.**

I have a number of specimens from Pecos. Compared with *sexlineatus* most of them have a slightly longer snout, causing the loreal and sometimes the postnasal to be elongated. There are seven light stripes, the additional one being median and of the same width as the laterals. This replaces the light dorsal area of *sexlineatus*. Usually the light stripe on the back of the thigh is absent, but it is well marked in one young example 110 mm. long. The collar scales are less enlarged and occupy a somewhat triangular space in the centre, and the edge of the collar is usually formed by one or two rows of small granules, although two of my specimens have large scales on the edge. The gular tract of minute scales contrasts less strongly with those surrounding it, and the dorsal scales are coarser. According to Cope the femoral pores are 19, but in ten which I have examined they are 13-18, averaging 15. The hind leg may reach the axilla or the eye, but in most cases about touches the ear. One of my specimens has the anterior supra-orbital separated from the next one by small granules. The largest is 222 mm. long (tail 158). The proportions are slender.

Prof. Cope regards this form as a subspecies of *tessellatus*, with which in general its scutellation agrees, though I find the number of femoral pores to be much less; but it does not appear to take on the spotted pattern of that species, and the fact that both *sexlineatus* and *perplexus* are striped at all ages and are more nearly equal in size and proportions, in connection with their disposition to intergrade where they come together in Texas, seems to indicate that they should be placed together as subspecies. In both of them a few of the postantibrachials are sometimes a little enlarged, but in no case that I have seen do they even approach the large scuta characteristic of *C. gularis*.

***Cnemidophorus grahami* B. & G.**

This species is almost identical with *C. s. sexlineatus* in scale characters. The one specimen in the present collection has 21 femoral pores, which agrees with the number given by Cope. It has a freno-orbital

on one side. At present this rather rare form seems to be amply separated by color characters.

Cnemidophorus tessellatus (Say).

Two specimens of the color form noted by Cope as *C. t. tessellatus* were received in May, 1903. The largest measures 268 mm. (tail 178). They correspond closely with Cope's description, but one has the femoral pores 24, and the other 25, as against the maximum of 21 given by him. The brachials are in from four to seven rows. Both have round dark spots under the jaws, and in one the belly is tinged with orange. The hind leg reaches the eye or a little less.

A large series in the Academy's collection, secured by Messrs. Rehn and Viereck at Alamogordo, New Mexico, in 1902, shows no important variations from the Pecos specimens. Femoral pores 22-25, average of fifteen 23.

Cnemidophorus gularis B. & G.

Five examples from the Davis Mountains, south of Pecos, the largest of which measures 240 mm. (tail 142), have femoral pores 15-17; brachials in 4-5 rows; antibrachials 3-4; femorals 6; tibials 3. The hind limb is short, reaching only to the shoulder. There is a row of white spots in each dark stripe, but these do not merge into the light interspaces. There is a light dorsal area resembling but narrower than that of *C. s. sexlineatus*. Some examples in juvenile pattern much resemble that species in this respect, while in others the light area is represented by two narrow lines corresponding to its outer borders, but *gularis* may always be distinguished by the large scales under the forearm. Cope gives the femoral pores as 18-22, whereas, in a considerable series from Texas and New Mexico, I find but one with the number as great as Cope's minimum. They range from 15-18, with an average of 16.

While *sexlineatus* and *gularis* have doubtless had a common origin, the differentiation reached in adults is great, and I cannot regard the occasional retention of the earlier style of color marking by the young of *gularis* as true intergradation.

Eumeces obsoletus B. & G.

Three have been received from Pecos. I have also two from Seymour.

OPHIDIA.

Glauconia dulcis (B. & G.).

Eutænia proxima B. & G.

One specimen from Pecos measured 1,160 mm. (tail 280). This is the largest I have met with.

Entænia sirtalis parietalis (Say).

Entænia marciana B. & G.

Entænia eques (Reuss).

Nineteen specimens, all from the Davis Mountains. The dorsal stripe is yellow, often more or less orange; the laterals pale greenish. Ventrals 151-174; subcaudals 64-86. Occasionally there are nine upper labials. One of these specimens 700 mm. long has a very short tail, only .17 of the length.

Tropidonotus clarkii (B. & G.).

Tropidonotus rhombifer Hallow.

Tropidonotus sipedon transversus Hallow.

All the specimens received were light in color, with the markings so obscure as to be distinct only in the young.

Salvadora grahami B. & G.

Zamenis flagellum flagellum (Shaw).

Most of this form from Pecos have been of large size and pale color. Some show more or less of the narrow cross-bands, as in *Z. f. frenatus*; some have wide cross-bands, as are seen at times in *Z. t. ornatus*.

Two large ones, about 1,700 mm. long, were buff on the back, with distinct wide dark cross-bands. Top of head and ventrals pink, with darker red spots on the throat.

Zamenis tæniatus ornatus (B. & G.).

Coluber emoryi (B. & G.).

Coluber obsoletus lindheimeri (B. & G.).

Coluber subocularis A. Brown.

Eight specimens of this species have been collected, as far as is known. In addition to the four on which the original description was based, two more were received at the Zoological Gardens in 1902, and the New York Zoological Society has also received two, one of which was courteously sent me after death by Mr. R. L. Ditmars. The three now in my possession have the scales in 33 rows, and the upper labials 10-11. All seem to have come from the Davis Mountains.

Pityophis catenifer sayi (Schl.).

Very common and reaches a large size; the largest measured 2,085 mm. in length, with a circumference of 210 mm.

Arizona elegans Kenn.

All the specimens are noticeably reddish or pink on the dorsal line, between the spots.

I have also received this species from Seymour, Texas, collected by Mr. F. M. Deaver.

Contia episcopa episcopa (Kenn.).

One received in April, 1902, has the loreal absent, the nasal reaches the preocular on one side, and the prefrontal reaches the second labial on the other.

Diadophis amabilis B. & G.

One from the Davis Mountains, 530 mm. long, is light ash on the body including the outer row of scales; belly yellowish-salmon, becoming blood-red under the tail, the ventrals heavily spotted with black. No nuchal collar.

Ophibolus getulus sayi (Holbr.).

Most of those received from Pecos are of the color pattern called *O. splendidus* B. and G., with unspotted tracts on the back. I have elsewhere⁴ given reasons for refusing to recognize this color-form even as a subspecies. In the latest note which I have seen, supporting its distinctness,⁵ the author says: "It is true that western examples of what is usually called '*Ophibolus sayi*,' especially those from Arkansas and Indian Territory, approach the color pattern of *L. splendida*; but in the first place it is only an 'approach,' and in the second place they retain the normal number of 21 scale rows characteristic of the form which we have just named *L. holbrooki*" (= *O. g. sayi*). Prof. Cope also says:⁶ "I have not found any variation in the different scale formulas of the two." The only comment to be made is that these gentlemen can not have counted the scale rows in any large number of specimens. I have before me at this moment five living examples from Pecos, showing more than an "approach" to the pattern of *splendidus*, one at least even having the head unspotted except on the snout; three of these have 23 rows, and two have 21. The case seems analogous to that of *Crotaphytus baileyi*, already discussed, and does not strengthen the evidence for *splendidus*, unless selected individuals with 21 rows and usually spotted heads are to be called *O. g. sayi*, and those with 23 rows and usually unspotted heads are *O. splendidus*, even when they occur side by side—which would not commend itself as a conception of specific difference.

Ophibolus alternus A. Brown.

The type, from the Davis Mountains, is the only one known.

⁴ *Proc. Acad. Nat. Sci. Phila.*, 1901, p. 76

⁵ L. Stejneger, *Proc. U. S. Nat. Mus.*, Vol. 25, p. 152 (1903).

⁶ *Report U. S. Nat. Mus.*, 1898, p. 919.

Rhinochilus lecontei B. & G.

Heterodon nasicus B. & G.

Tantilla nigriceps Kenn.

The one specimen received had the ventral surface pinkish-salmon color in life.

Elaps fulvius (L.).

One specimen received.

Ancistrodon contortrix (L.).

One specimen received.

Crotalus atrox atrox B. & G.

Crotalus confluentus Say.

THE FAUNAL RELATIONS OF TEXAS REPTILES.

An attempt to determine the elements composing the local fauna above noticed, has led to a study of the reptiles of the entire State of Texas, the result of which is, in my belief, to establish three facts, hitherto not wholly free from uncertainty: first, that the boundary between the Austroriparian and Sonoran reptilian faunas lies approximately between the ninety-sixth and the ninety-eighth meridians of longitude in Texas; second, that the restricted Texan district of Cope is not Austroriparian but Sonoran; third, that transcontinental zones of distribution can not be maintained in the Medicolumbian region for reptiles.

In his final essay upon the life regions of North America, determined mainly by a study of reptiles and batrachians, Prof. Cope⁷ placed the portion of Texas extending from the high lands east of the Pecos river to a north and south line about the longitude of Austin, in his Texan district of the Austroriparian subregion, and the portion east of it, in the Louisianian district. Western Texas he attached to his Chihuahuan district of the Sonoran subregion, which included the higher portion of central and northern Mexico, and stretched west through southern New Mexico and Arizona to southern and Lower California. The great plains from northern Texas, east of the Rocky Mountains, excepting the east and west river bottoms, he called the Central district of the Sonoran.

Dr. C. Hart Merriam,⁸ basing his conclusions chiefly upon the distribution of plants and mammals, established more or less parallel zones stretching completely across the continent from the Atlantic to the Pacific, the greater part of temperate North America being occupied

⁷ *Rep. U. S. Nat. Mus.*, 1898, pp. 1199-1234.

⁸ *Proc. Bio. Soc. of Wash.*, 1892, Vol. VII; and *Nat. Geog. Mag.*, 1894.

by the Upper and Lower Austral, each divided into a Humid district beginning at the Atlantic coast and merging insensibly into an Arid on the plains west of the Mississippi. The boundaries of his humid or Austroriparian division of the Lower Austral agree in the main with Cope's Austroriparian subregion, and the arid division, which he termed the Lower Sonoran, with Cope's Chihuahuan.

In Cope's view⁹ the distribution of reptiles does not accord with the arrangement proposed by Merriam, for the reason that both in the east and the west, relationships in this class are much closer from south to north, than horizontally.

In the following examination, the term Austroriparian is used to denote the subregion so named by Cope, minus his Texan district. For present purposes I include in it his Floridan subregion. Sonoran is also used in Cope's sense.

I am able to find reliable records of the occurrence of one hundred and sixteen¹⁰ species and subspecies of reptiles within the State of Texas, and by plotting all the localities of their collection known to me, upon a map, they arrange themselves into the following categories:

I.—Sonoran species, which appear to range little, if at all, east of longitude 96° in Texas:

A.—Chihuahuan:¹¹

<i>Cinosternum flavescens</i>	<i>Sceloporus variabilis</i>
<i>Testudo berlandieri</i>	<i>scalaris</i>
<i>Chrysemys ornata</i>	<i>Phrynosoma cornutum</i> C.
<i>Crotaphytus collaris</i> C.B.	<i>modestum</i>
<i>wislizeni</i> B.	<i>Eublepharis variegatus</i>
<i>Holbrookia texana</i>	<i>Heloderma suspectum</i>
<i>maculata</i> C.	<i>Cnemidophorus tessellatus</i> B.P.
<i>Uta stansburiana</i> B.	<i>perplexus</i>
<i>ornata</i>	<i>gularis</i>
<i>Sceloporus torquatus poinsetti</i>	<i>Gerrhonotus liocephalus</i>
<i>yarrovi</i>	<i>Barisia imbricata</i>
<i>ornatus</i>	<i>Eumeces guttulatus</i>
<i>spinosus clarkii</i>	<i>obsoletus</i> C.
<i>consobrinus</i> C.	<i>Anniella texana</i>
<i>couchi</i> ¹²	<i>Glauconia dulcis</i>

⁹ *l. c.*, p. 1205

¹⁰ *Macrochelys lacertina*, *Chelydra serpentina* and *Eutania radix* doubtless enter Texas, but I have no exact localities, and they are omitted here.

¹¹ The letters C. E. B. P. indicate that the species also enters the districts known respectively as Central, Eastern, Basin and Pacific.

¹² Taken at Devil's river, Tex., in 1903, by Prof. H. A. Pilsbry.

<i>Diadophis regalis</i> C.	<i>Ophibolus alternus</i>
<i>Zamenis taniatus taniatus</i> B.P.	<i>Contia episcopa isozona</i>
<i>taniatus ornatus</i>	<i>Hypsiglena ochrorhyncha</i> ¹³
<i>Salvadora grahami</i>	<i>Tropidonotus sipedon transversus</i> C.
<i>Coluber emoryi</i> C.	<i>Eutænia marciana</i>
<i>bairdi</i>	<i>eques</i>
<i>subocularis</i>	<i>Tantilla nigriceps</i> C.
<i>Arizona elegans</i>	<i>Crotalus molossus</i>
<i>Rhinochilus lecontei</i>	<i>atrox atrox</i>
<i>Ophibolus dolatus annulatus</i>	<i>lepidus</i>

B.—Central:

<i>Terrapene ornata</i>	<i>Ophibolus calligaster</i> wE.
<i>Eumeces multivirgatus</i>	<i>Tropidoclonium lineatum</i> wE.
<i>Heterodon nasicus</i>	<i>Eutænia sirtalis parietalis</i> B.P.
<i>Zamenis constrictor flaviventris</i> B.P.	<i>Sistrurus catenatus consors</i> ¹⁴
<i>Pityophis catenifer sayi</i>	<i>Crotalus confluentus</i>

C.—Texan (restricted):

<i>Aspidonectes emoryi</i>	<i>Eumeces pachyurus</i>
<i>Crotaphytus reticulatus</i>	<i>tetragrammus</i>
<i>Holbrookia propinqua</i>	<i>brevilincatus</i>
<i>Lysopticus lateralis</i>	<i>Coluber obsoletus lindheimeri</i>
<i>Sceloporus thayeri</i>	<i>Contia episcopa episcopa</i>
<i>Cnemidophorus grahami</i>	<i>taylori</i>
	<i>Amphiarctis inornatus</i>

II.—Chihuahuan and Central species, which extend east of longitude 96° (wA. or wE. indicates that the species barely enters the western part of the region):

<i>Chrysemys elegans</i> wA.	<i>Ophibolus getulus sayi</i> wA. wE.
<i>Sceloporus spinosus spinosus</i> ¹⁵	<i>Eutænia proxima</i> wA. wE.
<i>Diadophis amabilis</i> wA.	<i>Tantilla gracilis</i> wA.
<i>Tropidonotus clarkii</i>	

III.—Austro-riparian species, which enter Texas but do not appear to extend west of longitude 98° (E. are also Eastern):

<i>Alligator mississippiensis</i>	<i>Tropidonotus sipedon fasciatus</i>
<i>Aspidonectes ferox</i>	<i>grahami</i>

¹³ Received at the Zoological Gardens in 1903 from Seymour, Tex.

¹⁴ = *Crotalophorus edwardsi* B. and G.

¹⁵ = *Sceloporus floridanus* B. and G.

<i>Aromochelys carinatus</i>	<i>Storeria dekayi</i> E.
<i>Terrapene carolina carolina</i> E.	<i>occipitomaculata</i> E.
<i>carolina triunguis</i>	<i>Haldea striatula</i> E.
<i>Testudo polyphemus</i>	<i>Spilotes corais couperi</i>
<i>Anolis principalis</i>	<i>Heterodon platyrhinus</i> E.
<i>Sceloporus undulatus</i> E.	<i>Ophibolus doliatus doliatus</i> E.
<i>Liolepisma laterale</i> E.	<i>doliatus coccineus</i>
<i>Ophisaurus ventralis</i>	<i>Virginia elegans</i>
<i>Eumeces quinquelineatus</i>	<i>Sistrurus miliarius</i>
<i>Eutania sirtalis sirtalis</i> E.	<i>Crotalus horridus</i> E.

Of the above, *Aromochelys carinatus*, *Tropidonotus grahami* and *Virginia elegans* are not known east of the Louisianian district.

IV.—Austroriparian species, which extend west of longitude 98° in Texas:

<i>Chrysemys mobiliensis</i>	<i>Ancistrodon piscivorus</i>
<i>Zamenis flagellum flagellum</i>	<i>Elaps fulvius</i>
<i>Tropidonotus rhombifer</i>	

To these are to be added *Cnemidophorus sexlineatus*, *Cyclophis æstivus*, *Liopeltis vernalis* and *Ancistrodon contortrix*, which are also Eastern and to some extent Central.

V.—Neotropical intrusions:

<i>Drymobius margaritiferus</i>	<i>Sibon septentrionale</i>
<i>Erythrolamprus imperialis</i>	

It is seen that seventy-three Sonoran species practically fail to range east of longitude 96° in Texas, while but seven pass eastward to any distance beyond that meridian, five of these entering the western part only of the Austroriparian, while the two others are exceedingly rare east of the Mississippi river.

Of species which belong to the Austroriparian and Eastern, twenty-four which enter Texas do not extend much beyond longitude 98°, while but nine pass beyond it into western Texas, and of these three are of aquatic habits and four more are widely ranging forms.

If anything is made clear, therefore, by a study of these lists, it is that the zone of change between the eastern and the western faunas is this north and south belt lying approximately between the 96th and 98th meridians. This area nearly coincides with that in which the heavy rainfall of the Gulf Coast drops to below thirty inches annually, and lies somewhat eastward of where the arid region may properly be said to begin, the line of twenty inches rainfall being just west of the

100th meridian—a fact which suggests that species belonging to the dry plains fauna may endure a small addition of moisture better than those from a moist region can withstand drought. In a general way it is also the region where elevations of less than 1,000 feet begin the rise which reaches to between 3,000 and 5,000 on the plateau bordering the Pecos river. Its western boundary is probably the beginning of what Cope terms “the first plateau.”

The geographical limits of Cope's Texan district are nowhere clearly marked out by him, and his views as to its affinities were subject to change. In 1875¹⁶ he says the Sonoran “occupies the lower valley of the Rio Grande, and extends into Texas as far as the desert east of the Pecos.” East of this lay his Texan district, without defined limits on the east and south, which he assigns to the Austroriparian subregion. In 1880¹⁷ he speaks of the Texan district as Sonoran, and appears to consider it as beginning on the west at about 3,000 feet elevation, its eastern boundary running north and south near longitude 98° to within twenty miles of San Antonio, from whence it stretched west to the Rio Grande. In 1896¹⁸ he returned without comment to his earlier opinion and put the Texan district back in the Austroriparian.

It may be possible at present to reach a definite opinion as to its proper association.

If the Texan district be regarded as beginning at the debatable zone which has been indicated here, between 98° and 96° longitude, and extending south to the Rio Grande and west to the Pecos river, it is found that the elements composing its reptilian fauna are the following:

Sonoran: Chihuahuan.....	39
Central.....	8
	— 47
Texan (restricted).....	13
Austroriparian	5
Of wide range.....	4
	—
	69

As far as is now known several of its peculiar species, as *Holbrookia propinqua* and *Sceloporus thayeri*, range slightly to the south and west, outside of the boundaries here assigned to it, and may ultimately have to be regarded as Chihuahuan, but in the main they appear to be confined to these limits. A guide to its western boundary may be found

¹⁶ Bull. U. S. Nat. Mus., No. 1, p. 68.

¹⁷ Bull. U. S. Nat. Mus., No. 17, p. 46.

¹⁸ American Naturalist, November and December, 1896.

in the absence of the Chihuahuan species *Crotaphytus wislizeni*, *Uta stansburiana*, *Sceloporus spinosus clarkii*, *Cnemidophorus perplexus* and *Crotalus molossus*, none of which seem to range east of the Pecos.

This large number of peculiar species quite justifies the setting aside of a Texan district, but the overwhelming proportion of its Sonoran forms relegates it to that subregion, and not to the Austroriparian, with which it was finally associated by Cope.

The boundary thus determined between the Austroriparian and Sonoran subregions corresponds closely to that given by Merriam¹⁹ to his Humid and Arid divisions of the Lower Austral, and it remains only to inquire into the reciprocal relations of the reptiles inhabiting these areas.

The Chihuahuan and Texan districts together share twenty-three species with the Central, while of the sixteen which they have in common with the Austroriparian, five (*Chrysemys elegans*, *Diadophis amabilis*, *Ophibolus getulus sayi*, *Eutania proxima* and *Tantilla gracilis*) are also Central and only enter the western part of the Austroriparian. Four more (*Cnemidophorus sexlineatus*, *Cyclophis æstivus*, *Liopeltis vernalis* and *Ancistrodon contortrix*) are both Central and Eastern. But seven species are therefore left common to and restricted to the Sonoran and Austroriparian (*Chrysemys mobilensis*, *Sceloporus spinosus spinosus*, *Tropidonotus clarkii*, *Tropidonotus rhombifer*, *Zamenis flagellum flagellum*, *Elaps fulvius* and *Ancistrodon piscivorus*), and of these, four being aquatic are rendered in some degree independent of the laws governing the migration of land forms. So far as their species are concerned these two subregions have very little in common.

Turning now to the genera recorded from Texas, twenty-five, found in both subregions, are of such wide range in the Medicolumbian that they are without bearing on the present question and may be left out of consideration.

The following Sonoran genera do not enter the Austroriparian:

<i>Crotaphytus</i> C.B.	<i>Barissia</i>
<i>Holbrookia</i> C.	<i>Anniella</i>
<i>Uta</i> B.	<i>Glauconia</i>
<i>Lysopticus</i>	<i>Salvadora</i>
<i>Phrynosoma</i> C.B.	<i>Arizona</i>
<i>Eublepharis</i>	<i>Rhinochilus</i> C.
<i>Hcloderma</i>	<i>Contia</i>
<i>Gerrhonotus</i>	<i>Hypsiglena</i> C.
	<i>Amphiardis</i>

¹⁹Proc. Biol. Soc. of Wash., Vol. VII, p. 28 and map.

Of Austroriparian genera these do not range into the Sonoran:²⁰

<i>Alligator</i> N.	<i>Farancia</i>
<i>Anolis</i> N.	<i>Rhadinia</i> N.
<i>Ophisaurus</i>	<i>Stilosoma</i>
<i>Rhineura</i> N.	<i>Cemophora</i>
<i>Spilotes</i> N.	<i>Seminatrix</i>
<i>Abastor</i>	<i>Liodytes</i>

I do not know of a single truly Sonoran genus which extends into the Austroriparian which is not found in other subregions as well. No strictly Austroriparian genus extends into the Chihuahuan, and no genus is common to both areas which is not found elsewhere. So far as genera are concerned, the only bond of unity between the two halves of the Lower Austral (=Austroriparian+Texan and Chihuahuan of Cope) is that they alone in the Medicolumbian share *Testudo*, *Tantilla* and *Elaps*, all of which are Neotropical.

The Sonoran shares the following genera with the Central: *Crotaphytus*, *Holbrookia*, *Phrynosoma*, *Rhinochilus*, *Hypsiglena*.

It is clear, then, that the community in reptiles between the Sonoran and the Austroriparian is much less than that between the Sonoran and the Central; it is, in fact, limited to widely ranging genera.

While it is not intended to go into the details of distribution throughout North America, a few general observations must be stated, because of their bearing upon the present question.

The usual tests, such as differentiation, predominance in numbers, and genetic relationship, used in determining centres of distribution, all point among reptiles to the two southern centres in the Medicolumbian, to which attention has been directed by Prof. C. C. Adams,²¹ the location of which corresponds to the southeastern Austroriparian and the Chihuahuan. The former gave rise to nearly all the aquatic turtles. It has supplied most of the widely ranging genera of snakes, some of which, as *Coluber*, *Zamenis* and *Tropidonotus*, as well as *Emys* among turtles, are found also in the Eurasian portion of the Holarctic. Its scarcity of lizards amounts to poverty. The reptiles of the Eastern subregion are almost wholly derived from this southeastern centre; no genus is peculiar to it, and but few species, especially east of the Alleghenies. The differences between its eastern and western portions are considerable, and in the Mississippi valley it shares a few snakes with the Central, some of which are Texan and Chihuahuan. Upon reptiles alone, the Eastern could hardly be maintained as a subregion apart from the Austroriparian and of equal rank.

²⁰ Those marked N. are Neotropical.

²¹ *Biol. Bull.*, Vol. III, p. 121 (1902)

The Chihuahuan has given origin to no widely ranging snakes except *Crotalus* and *Sistrurus*. Its great wealth of lizards has not spread extensively into the Atlantic slope. *Sceloporus* and *Cnemidophorus* being represented there by but one species each; *Eumeces* by one which reaches to Canada and perhaps two others more southern and scarce in numbers; and the one species of *Liolepisma*, reaching to New Jersey.

That the Austroriparian fauna is the older of the two is made probable by the geological age of the region, and certain by the character of its forms, many of which belong to genera widely spread in the Holarctic, others having obvious genetic relationship to these or to other ancient forms. The separate identity of these two faunas, as far back as they can be traced, confirms the conclusion already reached from their present distribution, that the association of the Sonoran with the Austroriparian into one transcontinental zone is unnatural and cannot be maintained for reptiles.

How far the stations occupied by reptiles conform to Dr. Merriam's vertical zones, when the attempt is made to correlate these in widely distant localities, can not now be determined. At a later time I hope to examine this branch of the subject in some detail, but even with the limited amount of information now available of the kind needed, certain anomalies appear which do not seem open to explanation by that theory.

Indeed the proposition that all forms of life must conform to the same areas of distribution accords with neither theory nor facts. It may be, as stated by the distinguished author of trancontinental life zones,²² and doubtless is, illogical to assume that a faunal and a floral map must differ; but it is quite otherwise to assume as a working hypothesis that they may do so, and when organisms differ as widely in physiological adaptations as reptiles, for instance, do from mammals, the assumption that their reactions to the same conditions of environment must be similar, certainly is not far from likeness to a well-known logical fallacy.

While there can be no doubt of the controlling influence of temperature upon the distribution of reptiles as a class, it is quite certain that moisture plays a more important part in regulating the range of its genera and species than is the case with either mammals or birds, especially when their limited powers of migration are considered.

The details of their distribution in the southern divisions of the Medicolumbian sufficiently show its potency.

²² No. *Am. Fauna*, No. 3, p. 27.